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Content-Area Instruction and Teacher Professional Development: Addressing Secondary English Language Learners' Academic and Linguistic Needs

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Content-Area Instruction and Teacher Professional Development: Addressing Secondary English Language Learners' Academic and Linguistic Needs

by

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Abstract

Content-Area Instruction and Teacher Professional Development: Addressing Secondary English Language Learners' Academic and Linguistic Needs

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English language learners (ELLs) are the fastest growing group of learners in U.S. schools. In recent years, much of this growth has occurred in parts of the U.S. with historically smaller immigrant populations. Secondary ELLs in particular are entering middle and high schools that are often underprepared and ill-equipped to meet these students' academic and linguistic needs. In addition to learning social English, ELLs must also master the academic language and content necessary to succeed in their content-area classes. This report reviews current research on content-area instruction in math, science, and social studies for secondary ELLs. More specifically, within each content area, key findings are summarized from articles that address the following topics: the linguistic challenges of learning content for ELLs; the implementation of pedagogical approaches to teaching content to ELLs; and teachers' challenges and needs. The report concludes with recommendations for pedagogy, practice, and professional development as well as suggestions for future research.

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ELLs in Secondary Schools

English language learners (ELLs) are the fastest growing segment of the U.S. school population. Between the 1998-1999 and 2008-2009 school years, the total pre-K-12 enrollment in U.S. schools increased by about 7%. In contrast, during this same time period, the total number of pre-K-12 ELLs increased by 51% (National Clearinghouse for English Language Acquisition, 2011). By the 2008-2009 academic year, more than 5.3 million ELLs were enrolled in U.S. public schools, comprising nearly 11% of the total school population. In the same decade, ten states with traditionally small numbers of ELLs saw more than a 200% growth in ELL enrollment in their schools (Migration Policy Institute, 2010; National Clearinghouse for English Language Acquisition, 2011). Furthermore, while the total U.S. population is projected to grow by 142 million between 2005 and 2050, new immigrants and their children are expected to account for 82% of that number (Pew Hispanic Center, 2008). This growth will certainly have an impact on future numbers of ELLs in U.S. schools.

Currently, a significant achievement gap exists between ELLs and their native English-speaking peers in secondary school. Recent National Assessment of Educational Progress (NAEP) results reveal that non-ELLs far outperform ELLs in measurements of math, reading, and science. While two-thirds to three-quarters of all non-ELLs scored at or above the basic level of achievement in assessments of reading and math at grades eight and twelve and science at grade eight, more than 70% of ELLs scored below the basic level of achievement (National Center for Education Statistics, 2009a, 2009b, 2011a, 2011b). For the eighth-grade science and twelfth-grade mathematics assessments, the percentages of ELLs scoring below the basic level of achievement were exceptionally high, 86% and 81% respectively (National Center for Education Statistics, 2009a, 2009b). In addition, ELLs are far more likely to drop out of school than non-ELLs, especially newly-arrived ELLs. Almost a quarter of all teenagers who drop out of school are foreign-born (Pew Hispanic Center, 2005). Furthermore, compared to 93% of white, non-Latino students, only 61% of Latino students, many of whom are ELLs, will graduate high school. Of these graduates, just 10% of Latinos, in contrast to 29% of white, non-Latinos, will go on to attain a bachelor's degree (National Center for Public Policy and Higher Education, 2005). The causes of ELLs' lagging achievement are complex and include factors such as systematic curricular tracking (Callahan, 2005; Faltis & Arias, 2007), segregation and isolation in low-performing schools (Faltis & Arias, 2007; Freeman & Freeman, 2009), lack of development of students' L1s (Menken & Kleyn, 2011), and socioeconomic status (Hakuta, 2000). Whatever the reasons, the statistics are alarming and reveal the urgent need for measures that will help close the achievement gap between ELLs and their non-ELL classmates.

With its focus on accountability and high-stakes testing, No Child Left Behind (NCLB) requires that states and their school districts show that *all* students, including ELLs, make adequate yearly progress as measured by state standardized assessments. A primary goal of the law states that 100% of U.S. students will reach proficiency levels in reading and mathematics by the 2013-2014 academic year. Under NCLB, ELLs are therefore required to take the same content-area assessments in math, science, social studies, and English language arts that native English speakers take, despite the fact that they are still in the process of mastering English. A complicating factor is that states' content-area assessments are specifically developed for native English speakers and administered only in English. As a result, content-area tests may fail to reveal what ELLs really know if students' performances are negatively affected by the linguistic complexity of such exams (Menken, 2010). ELLs are therefore at a great disadvantage when their individual performances and graduation eligibility are determined by tests that may have questionable validity with regard to accurately assessing their content knowledge.

The World-Class Instructional Design and Assessment (WIDA) Consortium in collaboration with the Center for Applied Linguistics (CAL) are currently working on the development of computer-based math and science assessments that would more accurately measure the academic achievement of beginning ELLs. These assessments, called ONPAR, measure the same content as traditional tests but are less language dependent (World-Class Instructional Design and Assessment, 2011). Experimental study results for the ONPAR Science assessment at grades four and eight indicate that low-level ELLs performed significantly better on the ONPAR test than on a traditional test of the same content (WIDA Consortium & Center for Applied Linguistics, 2009). A pilot study is currently underway for the ONPAR High School Science Test (WIDA Consortium & Center for Applied Linguistics, n.d.). While these assessments are not operational yet, they represent a step in the right direction toward the development of valid content-area assessments for beginning ELLs.

Secondary ELLs: Their Linguistic and Academic Needs

Clearly, schools nationwide face tremendous challenges as they work to help ELLs reach high levels of achievement in order to meet state and national expectations. The academic hurdles are especially high for students in middle and high schools, where typically fewer resources exist for ELLs and content-area teachers tend to be less prepared than their elementary counterparts to teach language and literacy to students in their classes. In addition, ELLs in secondary schools are a heterogeneous group. Nationwide, ELLs speak more than 350 primary languages (L1s), although Spanish is the dominant L1 of nearly 77% of ELLs (U.S. Department of Education, 2003). Also, the ELL population in secondary schools is comprised of three different types of learners: newly-arrived students with adequate formal schooling; newly-arrived students with limited formal schooling (LFS students); and long-term English learners (LTELs) (Freeman & Freeman, 2002, 2009). This variety poses difficulties for educators and administrators in determining how best to meet the diverse academic and linguistic needs of secondary ELLs.

While students with adequate formal schooling still need ESL support, because of their prior education and literacy skills in their L1, they perform better academically than the other two groups of ELLs and tend to be mainstreamed after one or two years (Freeman & Freeman, 2002). It is LFS students and LTELs that face the biggest challenges in secondary school. LFS students arrive in U.S. schools with limited or interrupted schooling in their home countries. As a result, they may lack literacy skills in their native languages and foundational knowledge in subjects such as math, science, and social studies. LFS students must face the challenge of acquiring both conversational and academic English as well as middle- and high-school level academic content knowledge. The last group, LTELs, deemed the "less obvious population of ELLs" (Freeman & Freeman, 2009), often present educators with the greatest challenges. LTELs have been in U.S. schools for seven or more years but are still identified as limited English proficient (LEP) and need special language services (Freeman & Freeman, 2009; Menken & Kleyn, 2011). In fact, more than 57% of adolescent ELLs were born in the United States, and are considered second and third generation (Migration Policy Institute, 2007). Despite having native-like fluency in oral, conversational English and receiving most or all of their education in U.S. schools, LTELs still struggle to learn academic English and consistently fall behind their native English speaking peers in terms of academic achievement.

ELLs in secondary schools have significant linguistic and academic needs. First, ELLs must develop the academic English necessary to read and write in their content-area classes. In contrast to conversational language, academic language is cognitively demanding and context-reduced (Cummins, 1981). Therefore, students typically cannot use external clues or prior background knowledge to help with comprehending academic text. In addition to learning individual vocabulary words, ELLs must master elements of syntax, discourse, and register that comprise both oral and written academic language (Freeman & Freeman, 2009). ELLs also have to cope with content-area textbooks that are filled with dense, technical, and abstract language (Fang, 2008). Acquiring the language and discourse valued in academic settings is paramount to ELLs' educational success and trajectories in secondary school and beyond.

Second, ELLs must develop the content knowledge in subject areas such as math, science, and social studies in order to catch up academically with their native English-speaking peers. Research has shown that it can take five to seven years for ELLs to develop academic proficiency in English (Cummins, 1981, cited in Collier, 1987). How quickly ELLs reach proficiency in subject areas such as math, science, and social studies is determined by a number of factors, such as their length of residence in the U.S., previously acquired literacy and math skills in their L1s, and socioeconomic status (Collier, 1987; Hakuta, 2000). Given the urgency for ELLs to master English as well as academic content, it is imperative that ELLs, even newcomers, acquire English and content simultaneously. Proficiency in English has previously been viewed as a prerequisite to learning content (Minicucci & Olsen, 1992); however, delaying content instruction until ELLs attain a minimal level of English proficiency denies students equitable access to the same rigorous curriculum that their native English speaking classmates have. Therefore, language and content instruction must be integrated and appropriately modified to maintain rigor in order to help ELLs of all proficiency levels succeed in school and close the achievement gap.

Pedagogical Approaches to Integrating Language and Content Instruction

Different pedagogical approaches have emerged to integrate language and content instruction for ELLs. The Cognitive Academic Language Learning Approach (CALLA) was designed to prepare intermediate- and advanced-proficiency ELLs for mainstream classes in math, science, and social studies (Chamot & O'Malley, 1987). The CALLA model promotes the teaching of learning strategies (metacognitive, cognitive, and social-affective) to help students acquire grade-appropriate content and academic English. CALLA lessons focus on content-area topics and include language and content objectives, explicit strategy instruction and practice, and effective ESL teaching strategies.

Sheltered instruction, also known as SDAIE (Specially Designed Academic Instruction in English), is a teaching approach that emphasizes instructional modifications to make content comprehensible for ELLs while supporting their development of English. It can be used by mainstream teachers in content-area classes with a mix of native and non-native English speakers or by ESL teachers in classes made up entirely of ELLs. Díaz-Rico and Weed's (2002) model of SDAIE provides teachers with a framework of appropriate ELL instruction that consists of five components: teacher attitude, content, connections, comprehensibility, and interaction.

One specific model used to evaluate teachers' implementation of sheltered instruction is the Sheltered Instruction Observation Protocol (SIOP) Model. The SIOP

Model incorporates the key features of sheltered instruction within eight main components that emphasize best practices for ELLs (Echevarria, Vogt, & Short, 2000). In both SIOP and SDAIE lessons, teachers include content and language objectives and specifically select and modify activities to align with students' language proficiencies and learning styles. Teachers also help their students connect to what they are learning by tapping into their prior experiences and background knowledge. They employ specific techniques, such as contextualization, modeling, and cooperative learning, to make content comprehensible. Finally, they provide numerous opportunities for student interaction and allow learners to show their knowledge in alternative ways (Díaz-Rico & Weed, 2002; Echevarria, Vogt, & Short, 2000). Studies have proven the effectiveness of the SIOP model, revealing that both ELLs and non-ELLs who receive SIOP instruction outperform students in comparison groups on measures of academic language and literacy (Short, Echevarría, & Richards-Tutor, 2011). Such results attest to the strength and promise of the model and should help allay educators' concerns about how to effectively teach both English-only students and ELLs in the same content classrooms. Furthermore, teachers may be more open to using specific ELL approaches when they benefit all students.

Though research has shown the positive impact of sheltered instruction on student achievement (Short, Echevarría, & Richards-Tutor, 2011), poor implementation of the pedagogy poses a direct threat to its effectiveness. While sheltered instruction can be used with ELLs in mainstream classes, it is more often the case that ELLs are segregated into separate sheltered content classes. In theory, sheltered content classrooms should help ELLs access the same curriculum as their native English-speaking classmates. However, research has shown that sheltered content classes may actually limit ELLs' exposure to rigorous content due to a lack of appropriate instructional materials and adequately-trained teachers. In addition, ELLs are linguistically and socially isolated from their native-English speaking peers, which denies them access to rich language learning opportunities (Callahan, 2005; Faltis & Arias, 2007). While separate classes and instruction may be beneficial to ELLs who are newcomers, long-term segregation will only negatively impact students' academic and language development as well as their overall educational success.

ELLs in Mainstream Classrooms

Despite the existence of proven, research-based models of instruction, such as the SIOP model, statistics show that the majority of teachers are untrained and underprepared to teach ELLs. Only 12.5% of teachers have received eight or more hours of training on how to teach ELLs (National Center for Education Statistics, 2002). In schools where total numbers of ELLs are smaller, students are more likely to spend most of their time in mainstream classes with teachers who may lack ESL training and who are less likely to integrate language instruction into their content teaching.

Mainstream teachers have complex and contradictory attitudes about the inclusion of ELLs in their classrooms. Reeves (2006) found that while most mainstream teachers welcomed ELLs into their classes, they were resistant to working with students with low levels of English proficiency. Harklau (1994) observed that mainstream teachers rarely made adjustments to make content comprehensible for ELLs and provided limited opportunities for students to produce extended discourse in class. Finally, mainstream teachers' perceptions of language acquisition – that ELLs can acquire English in only two years and should avoid using their first languages in the process – are not supported by research (Reeves, 2006). Clearly, both pre-service and in-service teachers need a better understanding of how to meet the linguistic and academic needs of ELLs of all proficiency levels in their mainstream classrooms.

Purposes of the Research Review

Language minority students, or those students who speak a language other than English at home and who may not be proficient in English, are projected to make up 40% of the elementary and secondary school population by the year 2030 (Thomas & Collier, 1997). As ELLs grow in numbers, all teachers, both ESL and mainstream, will continue to face the challenge of how to best help these students master academic English and content simultaneously. The urgency and complexity of this situation prompted this research review on secondary ELLs in an effort to explore the following questions: What are the linguistic challenges of learning math, science, and social studies for ELLs? What kinds of practices have been implemented to teach math, science, and social studies to ELLs? How effective are these practices? What are teachers' challenges and needs with regard to teaching content to ELLs?

The following pages review current research, mostly from 2007 and later, which address these questions and raise additional issues with regard to secondary ELLs and content instruction. The research is organized by content area, and while the majority of the studies took place in the United States, two were conducted in South Africa and Australia. These international studies were included because clear parallels can be drawn between ELLs' situations in those countries and in the United States. Across the disciplines of mathematics, science, and social studies, the research topics primarily fall into three main categories: language issues; instructional practices and approaches; and teacher challenges and professional development needs.

Mathematics

A prominent theme to emerge from the literature on secondary ELLs and mathematics instruction was the teaching of the specific language of math. Math may be perceived as easy for ELLs because it seems to be a subject based entirely on numbers rather than words. However, mathematics, like social studies and science, is a discipline with its own specialized language that includes a large number of technical words, complex grammatical patterns, and symbols that may be country specific.

Multiple authors discuss the complexities of the math register in detail (Echevarria, Vogt, & Short, 2009; Ernst-Slavit & Slavit, 2007; Freeman & Crawford, 2008; Schleppegrell, 2007; Zwiers, 2008). In addition to uniquely mathematical terms (technicality), such as *numerator* and *hypotenuse*, the language of mathematics also includes many polysemous words with special meanings. Words such as *square, power*, or *product* have specific meanings in math, but ELLs may only be familiar with their more common definitions from everyday contexts. Also, imperatives such as *estimate, isolate,* and *calculate* are used throughout math texts and can be particularly difficult to teach and learn given their abstract nature (Zwiers, 2008). In addition to knowing individual mathematical vocabulary words, ELLs need to understand the syntactic structures employed in mathematics. Grammatical patterns regularly used in mathematics include lengthy noun phrases *(the area of a rectangle with sides 2 and 4 feet),* quantifying phrases *(the area of, the width of),* qualifying phrases *(a number which can be divided by*

2 and 7), and comparative structures *(greater than, less than)* (Ernst-Slavit & Slavit, 2007; Schleppegrell, 2007). Even the symbols for mathematical notation may cause difficulties for ELLs (Ernst-Slavit & Slavit, 2007). If ELLs have previously learned math outside of the United States, the way they write mathematical symbols may differ from how symbols are used in the U.S. For example, in some Latin American countries, a period, instead of a comma, is used to separate numbers in groups of three (e.g., 5.450.237 instead of 5,450,237). Mathematics teachers must become aware of the challenges that the language of math poses for ELLs and explicitly teach students the unique lexical and syntactic features as well as the appropriate symbols of the mathematics register.

Because communication is one of the National Council of Teachers of Mathematics (NCTM) Process Standards, students are expected to use the language of mathematics to communicate their thinking in the classroom (National Council of Teachers of Mathematics, 2000). Zwiers (2008) and Khisty (1992) both note the dearth of mathematics language they have observed being used in math classrooms. Khisty (1992) conducted research that examined the discourse characteristics of two middle school mathematics teachers and discovered that the teachers actually focused very little attention on the language of mathematics during their lessons. Despite the fact that the lessons she observed included much teacher to student and peer interaction, the "language of mathematics was strikingly absent" (Khisty, 1992, p. 8). Therefore, it is essential that teachers deliberately model using the language of math and provide opportunities for students to practice and apply this language in the classroom.

In her thorough review of research on mathematics teaching and learning, Schleppegrell (2007) discusses recent research exploring how educators can help students develop the mathematics register through explicit language instruction and classroom discourse. Other authors also offer pedagogical recommendations for teaching the language of math, as well as how to help students “talk math” (Echevarria, Vogt, & Short, 2009; Ernst-Slavit & Slavit, 2007; Slavit & Ernst-Slavit, 2007). Instructional recommendations that appear across the readings include: allowing students to use their home languages for learning; preteaching terms and language patterns in context; using realia and visual aids; identifying cognates; and creating opportunities for students to use newly-acquired language through meaningful interaction. Such strategies represent best practices for ELLs. They specifically help math teachers focus on the language ELLs need in order to comprehend math lessons, both in the classroom and in their textbooks, and become more proficient with using the mathematics register.

Multiple articles in the literature address the relationships between pedagogical practices, English language proficiency, and mathematics achievement (Beal, Adams, & Cohen, 2010; Freeman & Crawford, 2008; Hansen-Thomas, 2009; Pray & Ilieva, 2011). Freeman and Crawford (2008) investigated how HELP *(Help for English Language Proficiency)* Math, an online supplemental curriculum for middle- and high-school ELLs, affected their development of math knowledge and English proficiency. HELP Math is a Web-based program with interactive lessons that apply the techniques of sheltered instruction. The program emphasizes math vocabulary and includes language support features such as hyperlinked terms and a glossary in both English and Spanish. Pilot tests revealed that HELP Math was successful in helping middle-school ELLs simultaneously develop math content and English proficiency. Pretest and posttest results showed that ELLs in the HELP Math treatment group improved much more than students in the control group, an average improvement of 73% compared to 8%. Among the ELLs who showed improvement, the gains were far greater for those students whose English language skills were advanced compared to students at intermediate and beginner levels of English proficiency (Tran & German, 2005). A more recent study (Freeman, 2012) further reveals HELP Math's effectiveness in improving ELLs' math ability as well as their math self-efficacy. Technology-based programs such as HELP Math can greatly benefit ELLs by giving them more control over their learning and allowing them to access content through a digital format that may be less language dependent.

A more recent study also revealed connections between students' level of English proficiency and math performance (Beal, Adams, & Cohen, 2010). Beal, Adams, and Cohen analyzed multiple measures of math performance for about 400 ninth-grade Algebra 1 students, of which 47% were ELLs. The data showed that ELLs' English reading proficiency, as determined by California English Language Development Test (CELDT) scores, was significantly related to their math performance in several ways.

First, students' reading proficiency predicted their scores on the California Standards Test – Math (CST-Math). Second, reading proficiency had a positive influence on their performance on pre-and posttests specific to the study as well as problem solving in an online math tutorial. Finally, ELLs' reading proficiency also predicted their math self-concept. Students with higher levels of reading proficiency had better self-perceptions of their math abilities. In contrast, students' speaking and listening proficiency was not a predictor of math performance. Similar to the results from the HELP Math pilot study, the data showed that ELLs with higher levels of language proficiency, in this case, reading proficiency, showed higher levels of math achievement. Beal et al. conclude that students may need to reach a minimum level of reading proficiency before they begin to show improvements in math performance.

Two studies investigated how mathematics teachers' instructional techniques affected ELLs' math achievement and performance on assessments (Hansen-Thomas, 2009; Pray & Ilieva, 2011). Hansen-Thomas (2009) studied how three sixth-grade mathematics teachers used language within the district-mandated curriculum of the Connected Mathematics Project (CMP), a reform-based curriculum for the middle grades, to facilitate ELLs' participation in academic discourse. She also investigated how the teachers' linguistic practices affected ELLs' performance on academic assessments.

The CMP instructional model focuses on exploration, problem-solving, and discussion and aligns to NCTM's *Principles and Standards for School Mathematics*

2000. CMP supports many pedagogical strategies that benefit ELLs and has been used in schools with large populations of ELLs (Connected Mathematics Project, 2009a, 2009b). To draw students into their math lessons, all three teachers employed the same two linguistic practices: modeling and eliciting mathematical discourse. However, each teacher employed CMP to a different degree. Of the three teachers, the one who focused more on eliciting mathematical discourse and encouraged her students to interact was the most successful at effectively engaging ELLs to participate. By the end of the school year, the ELLs in her class saw significant improvements in their grades and standardized test scores. In contrast, students in the other teachers' classes did not perform as well on the standardized math exam, with some receiving the lowest scores in the district.

Pray and Ilieva (2011) explored how high-school mathematics teachers' use of ELL strategies affected the math achievement of their ELLs. Specifically, the researchers wanted to identify the ELL instructional strategies that had a positive effect on the students' state math assessment scores. Strategy use was determined through classroom observations and teacher interviews and compared to the test scores of beginning to intermediate ELLs and non-ELLs.

The authors discovered that visual and speech strategies had the biggest impact on ELLs at the earliest stages of English proficiency (pre-emergent, emergent, intermediate) and positively influenced their test scores. Visual strategies included using realia, pictures, and graphic organizers; modeling; and utilizing hands-on approaches and manipulative tools. Speech strategies included adjusting speech; using gestures; providing clear explanations; prompting students; paraphrasing; and using consistent wait time and appropriate pacing. Pray and Ilieva acknowledge that their findings of a connection between specific ELL strategy use and ELL achievement may seem obvious. However, because many secondary mathematics teachers lack the training and knowledge of how to teach ELLs, the researchers call for ongoing professional development for in-service teachers that combines mathematics and effective strategies for ELL instruction. The findings from both studies (Hansen-Thomas, 2009; Pray & Ilieva, 2011) reveal how the deliberate use of strategies that benefit ELLs positively impacts students' level of participation, academic achievement, and test scores in mathematics.

Two articles discuss the role that students' cultures and communities play with regard to teaching and learning mathematics (Ernst-Slavit & Slavit, 2007; Leonard, Napp, & Adeleke, 2009). Ernst-Slavit and Slavit (2007) emphasize the need for educators to take a 'cultural frame of reference' when teaching diverse students. Knowing learners' cultures and communities can help teachers connect mathematics instruction to relevant experiences drawn directly from students' lives. With regard to newly-arrived ELLs, teachers should recognize that students' prior mathematics knowledge or experiences in their home countries will likely be different from the experiences of LTELs and mainstream non-ELLs in the United States.

Through a case study, Leonard, Napp, and Adeleke (2009) investigated the challenges two high-school mathematics teachers faced in trying to implement culturally-relevant pedagogy (CRP) with their ELLs who were predominantly from Africa. The purpose of CRP is to "draw meaningfully on the cultures, languages, and experiences that students bring to classrooms to increase engagement and academic achievement for students of color" (Dutro, Kazemi, Balf, & Lin, 2008, p. 271). The two teachers designed a math project around the topic of McDonald's fast food, a subject they believed their teenage ELLs would easily relate to. However, they discovered early on that the topic was not culturally relevant to the particular group of students participating in the project. Interest was low because the students knew very little about McDonald's and fast food in general. While the students successfully completed the mathematical tasks in the project, few were able to relate to the topic. As a result, the project was more cognitively demanding for the students and their opportunities to further develop mathematical knowledge and cultural competence were limited. The researchers highlight the need for educators to understand and draw on their ELLs' prior funds of knowledge when implementing CRP. Given the diversity of secondary ELLs, especially among the largest group of ELLs, Hispanics, careful consideration must be given to students' cultural and linguistic backgrounds in order to ensure that all learners benefit from culturally-relevant teaching approaches.

A final, prominent theme to emerge from recent research about ELLs and the teaching and learning of mathematics is the use of two languages, sometimes called code switching, in the math classroom (McGraw & Rubinstein-Ávila, 2008; Moschkovich, 2007; Moschkovich, 2009; Setati, Molefe, & Langa, 2008; Zahner & Moschkovich, 2011). Moschkovich (2007) analyzes how two ninth-grade bilingual students code switch in Spanish and English during a mathematical conversation. Code switching used to be considered indicative of a linguistic deficiency in the learner's vocabulary; however, Moschkovich argues that code switching is actually "a complex, rule governed and systematic language practice" (2009, p. 1) that students implement to fulfill a variety of functions, such as to explain, elaborate, justify, describe, or reiterate. Moschkovich (2007) urges researchers to avoid a deficit view of code switching and further investigate how the practice can serve as a communication resource for learners doing mathematics. Furthermore, she points out that code switching allows students to use the language of math in both their L1s and English as well as participate more fully in mathematical discourse. Although the students who participated in the mathematical conversation had been in mainstream English-only classes for several years, and their English proficiency level was not provided, it is possible that these students may have been LTELs. Regardless, Moschkovich's analysis is certainly applicable to all types of ELLs, who might regularly code switch with their peers or teachers when doing and talking mathematics.

Setati, Molefe, and Langa (2008) conducted lesson observations in an eleventh-grade mathematics classroom in South Africa. The researchers focused on how learners' home languages can be deliberately and strategically used as a 'transparent resource' for teaching and learning mathematics. For the first time, the students received a real-world mathematical problem written in both their L1s and English and were encouraged to communicate in whichever language they preferred to solve the problem. Even though the students had never before been given a task written in their home languages, the visible presence of their L1s did not draw their attention away from the task.

The students’ fluid use of their L1s and English as they discussed the problem indicated that their home languages were functioning as a transparent, or invisible, resource, without distracting them from the task. By using the L1 as an invisible resource, the students were able to focus entirely on communicating their understanding of the math task rather than attend to L2 issues. The authors also point out how the L2 can be a ‘stumbling block’ for learning math, particularly for learners who may not have the English proficiency to successfully participate in mathematical tasks.

While this study took place in South Africa, the conclusions drawn also apply to secondary mathematics classrooms in the United States and raise questions about the benefits of English-only policies in some states. By prohibiting ELLs from using their L1 as a transparent resource, language can become a visible, potential obstacle to learning, and those students with low levels of English proficiency may be severely limited in their ability to actively engage with academic content.

Finally, McGraw and Rubinstein-Ávila (2008) observed how immigrant middle-school students in a dual-language mathematics classroom used their first language, Spanish, and English to reason mathematically. By using both their L1 and L2, the students were able to reach high levels of mathematical reasoning while solving a nonroutine math problem. Because mathematical reasoning plays an important role in the math classroom, it is critical that all students, including ELLs with low language skills, have the opportunity to develop this ability. The acquisition of content knowledge should not be dependent on a student's level of English proficiency. Therefore, teachers can facilitate high levels of mathematical reasoning by encouraging ELLs to make use of all of their linguistic resources, including both their L1 and English.

Science

In science, knowing the meaning of a single word may require comprehension of an abstract concept or an entire process. For example, to understand the meaning of the word *erosion,* students must understand the process of erosion – what causes it, why it happens, and how it happens. Semantically-dense nominalizations, such as *erosion,* are just one aspect of the specialized language of science. Many researchers have looked closely at the language of science, focusing in particular on (1) what makes it challenging for ELLs and (2) how teachers can effectively teach it (Bruna, Vann, & Escudero, 2007; Fang, 2006; Fang, 2008; Miller, 2009; Short, Vogt, & Echevarria, 2010; Zwiers, 2008). This research provides a clear picture of the linguistic difficulties that ELLs face in their science classrooms.

Fang (2006) conducts an in-depth analysis of the language of school science (LSS), comparing it to students' everyday language and discussing the difficulties it causes middle-school students with regard to reading comprehension. Basing his analysis on the work of applied linguists, he closely examines the language present in several major middle-school science textbooks, identifying the particular linguistic features at the lexical, syntactic, and discourse levels that frequently appear in the science texts. These features, which can pose significant challenges for ELLs, include technical and polysemous vocabulary (e.g., *photosynthesis, fault)*; abstract and lengthy nouns and noun phrases (e.g., *condensation, the cooling and solidifying of molten magma)*; complex sentences with multiple clauses; ellipsis; and the passive voice. Fang notes, "…school science inherits essential properties of professional science discourse, such as informational density, technicality, abstraction, and authoritativeness" (2006, p. 493). For ELLs, such technical, specialized vocabulary and sophisticated syntax can make science texts challenging at best and inaccessible at worst.

Fang (2008) emphasizes the transition students must make from primarily reading narratives with dialogue at the elementary grades to grappling with complex expository texts in the middle-school grades and beyond. In his article on expository reading, Fang (2008) compares and contrasts an elementary narrative with an intermediate-grade expository science passage, noting the significant differences in the background and linguistic knowledge required to comprehend each one. In contrast to the story, which contains everyday language about a familiar topic, the science text deals with a technical topic (DNA and genes), contains many abstract nouns, is lexically dense, and sounds more distanced and authoritative. Fang argues that the five basic reading strategies students acquire at the elementary grades– phonemic awareness, phonics, fluency, vocabulary, and comprehension strategies – are no longer sufficient in helping them comprehend dense expository texts. He provides numerous teaching strategies to raise students' awareness of the language of science and help them navigate expository texts, such as building vocabulary through roots and affixes, noun deconstruction and expansion, paraphrasing, and conducting 'syntactic anatomy,' or looking closely at the different parts that comprise complex sentences (Fang, 2006). It is critical that secondary science teachers become aware of the linguistic features that characterize their discipline and provide ELLs in their classrooms with clear and explicit strategies to dissect and unpack the language that comprises expository science texts.

Short, Vogt, and Echevarria (2010) also suggest that students reinforce the academic language of science they are learning by using it in oral discourse in the classroom. They urge teachers to move away from the typical initiation-response-evaluation/feedback (IRE/F) pattern and promote classroom discussions that allow students to elaborate on what they are learning, engage in higher levels of thinking, and use academic English.

Several authors mention using cognates as a strategy for coping with the language of science (Leier & Fregeau, 2010; Short, Vogt, and Echevarria, 2010). Cognates are words in different languages that have similar spellings and meanings. For example, science words such as *igneous / ígneo* and *hydrogen / hidrógeno* are English-Spanish cognates. Teachers should raise students' awareness of cognates and highlight how cognates can be helpful in learning new vocabulary.

In her article, Miller (2009) reports on a project to teach science vocabulary to Sudanese high-school refugee students in mainstream classes in Australia. While this research takes place outside of the United States, parallels can be drawn to LFS students in U.S. high schools, as all of the students involved in the project were ELLs with low levels of literacy and significant periods of interrupted schooling. The study was a follow-up to previous research in the same high school (Brown, Miller, & Mitchell, 2006). During the prior study, the school's ESL teachers specifically requested the researchers return to help the mainstream science teachers with scaffolding instruction for their ELLs. For the project, Miller and a small group of teachers and researchers developed an ESL-friendly science dictionary and vocabulary activity workbook to help one mainstream science teacher scaffold a unit of instruction for his ELLs in two different classes.

Data were collected through interviews with the teacher and students, both ELLs and non-ELLs, student journals, and a student questionnaire. The students' journal entries revealed their keen awareness that the "big words" in their textbook were a barrier to their learning and their feelings that the teacher was not doing enough to teach the vocabulary. The students found the workbook activities much more accessible than their science textbook and overwhelmingly rated the dictionary and workbook as being "useful" or "very useful." In interviews with the researchers, the teacher indicated that using the scaffolded materials prompted him to reevaluate his original assumptions about what the students knew and could do. However, the teacher shared that while the materials were of great help, there would not be enough time to provide the same type of scaffolds for other units. Based on her research, Miller identifies three key teacher needs. First, science teachers need a better understanding of the language that science entails and the difficulties it causes ESL students. Second, the author suggests that science and ESL teachers collaborate to share their content and linguistic knowledge with one another and reinforce the same science language within their classrooms. Finally, the author argues for professional development for science teachers that raises their awareness of the language of science and focuses on specific strategies to teach it.

Bruna, Vann, and Escudero (2007) also looked at explicit academic language instruction through a case study of a high-school science teacher. Specifically, they investigated how the teacher's understanding of academic language influenced her science instruction for ELLs. Because the teacher believed that building academic language was about building vocabulary, she focused her academic language instruction almost entirely on individual lexical items while failing to promote the development of the grammar that ties the discrete vocabulary words together to create meaning and semantic relationships. Her failure to model how to connect the vocabulary in a meaningfully way, at a syntactical level, limited her students' ability to produce extended discourse. The researchers note that while the results of this case study may not be generalizable, the findings bring up important issues regarding educators' conceptualization of what academic language teaching entails and how a lexically-driven approach to academic language instruction can limit students' opportunities to fully develop scientific concepts and discourse.

Multiple articles address pedagogical issues related to teaching science to ELLs. These articles investigate teaching strategies, teacher needs, and the effectiveness of specific models of instruction. Leier and Fregeau (2010) present ways science teachers can improve the effectiveness of their instruction for Hispanic ELLs in particular. Science teachers should collaborate with other content-area teachers who teach ELLs to integrate science themes into language arts, math, and social studies classrooms. They should use 'hands-on and cooperative' instructional approaches to make content less abstract and more contextualized. Teachers should also become aware of students' backgrounds and the cultural and environmental funds of knowledge they bring to the classroom. They can capitalize on this knowledge and facilitate learning through authentic topics with which students are familiar. Finally, teachers should employ non-traditional, authentic assessments that are less dependent on language to allow ELLs to show their science knowledge. While Leier and Fregeau's chapter addresses a particular subgroup of ELLs, Hispanics, many of the issues raised also apply to non-Hispanic ELLs.

Cho and McDonnough (2009) explore the challenges and needs of high-school science teachers who teach ELLs in Virginia, a state that has recently experienced exponential growth in the ELL population as part of the New Latino Diaspora (Hamann, Wortham, & Murillo, 2002). Between 2000 and 2010, Virginia's ELL population increased by nearly 250%, with some counties' numbers increasing by 300 to 600% (Virginia Department of Education, 2011). Due to this recent growth, there is a lack of infrastructure to support ELL students' needs, especially at the secondary school level.

Cho and McDonnough (2009) studied the responses of thirty-three high-school science teachers to a survey about accommodation strategies, challenges, and professional support and development with regard to teaching ELLs. The two biggest challenges that teachers indicated were the language barriers between themselves and their students and ELLs' lack of background knowledge in science. In addition, the teachers also felt challenged by a lack of time, resources, and school support. Of note is the teachers' response that the least challenging factor in teaching ELLs was cultural differences. The authors suggest this may indicate the teachers' lack of awareness of the importance of culture in the classroom simply because their students' language and content needs are so urgent.

The accommodations the teachers used the most were giving ELLs more time to complete tasks, adjusting their rate of speech, and grouping strategies. In contrast, the teachers responded that they never or rarely provide different tasks, assignments, and instructional materials for their ELLs or consult with ESL teachers. The authors speculate that the latter types of accommodations place a greater burden on the teacher and may require resources that are not readily available. It's also possible that teachers simply lack the knowledge of how to modify instruction or materials for ELLs.

Unsurprisingly, the majority of the teachers indicated that bilingual materials and training on ESL teaching strategies were critical or very important. While the sample size is insufficient to make the study's results generalizable to all secondary science teachers, the results clearly underscore the need for professional development on adapting instruction and materials to effectively meet the needs of ELLs.

The study's survey question regarding teacher challenges assumed a deficit perspective of ELLs, asking about "language barriers," "ESL students' lack of background knowledge," and "ESL students' lack of motivation." Unfortunately, such language only reinforces the belief that ELLs themselves are the problem. Reeves's (2006) survey instrument includes a good example of how the same issue can be explored through an open-ended question that does not promote a deficit view. The item about challenges in Reeves's survey asks, "Please list what you consider to be the *greatest challenges* of including ESL student in subject-area classes" (2006, p.142). In addition, research that looks at how science teachers capitalize on ELLs L1s and background knowledge and what might cause differences in motivation among ELLs would be more beneficial to the body of literature on science instruction and ELLs.

Multiple researchers have conducted studies on the effectiveness of particular models of instruction for teaching science to ELLs (August, Branum-Martin, Cardenas-Hagan, & Francis, 2009; Echevarria, Richards-Tutor, Canges, & Francis, 2011; Johnson, 2010; Manzo, Cruz, Faltis, & de la Torre, 2011). One large study by August and colleagues (2009) investigated the effectiveness of a science intervention program for nearly 900 middle-school ELLs and English proficient students. The program, called Quality English and Science Teaching (QuEST), included materials based on the 5E model of science instruction, an inquiry-based model developed by the Biological Science Curriculum Study (2006). The 5E model consists of five instructional phases, or strategies: engagement, exploration, explanation, elaboration, and evaluation. In addition, the QuEST intervention involved explicit vocabulary teaching, strategic student grouping, and weekly teacher mentoring. Posttest results revealed that students in the QuEST intervention group performed better in measures of science knowledge and vocabulary than students in the control group, who received regular instruction. What sets this study apart from other research is the finding that a single instructional approach, specifically designed for teaching ELLs, had a significant positive effect on both ELLs' and English-proficient students' achievement.

A much smaller study (Manzo, Cruz, Faltis, & de la Torre, 2011) also investigated the 5E model by looking at how six mainstream middle- and high-school science teachers incorporated the model into their classroom instruction with ELLs. Prior to the study, the teachers had participated in a nine-month program to learn about the 5E model. Classroom observations revealed two important findings. First, all six teachers were able to implement the 5E model to varying degrees, thereby increasing their ELLs' opportunities to fully participate in learning science content. However, the teachers' success in implementing the first strategy, the engagement strategy, determined how often the remaining strategies were used. Second, using the 5E model raised these mainstream science teachers' awareness of the complexities of teaching science to ELLs. These studies both show that in the science classroom, ELLs clearly benefit from instructional approaches incorporating ELL-specific strategies that enhance regular content instruction.

In a small, cluster-randomized study, Echevarria and colleagues (2011) investigated the effectiveness of the SIOP model with ELLs in middle-school science classrooms. This study compared the acquisition of academic language and science for students who received SIOP instruction to students in a control group. The teachers and students involved were randomly assigned to either treatment or control, with each group containing of a mix of English learners, former English learners, and English only students. The SIOP group teachers used specially developed SIOP lesson plans to teach the same four science units as teachers in the control group, who just used their normal teaching methods. While students in the SIOP group performed better than students in the control group on the study's posttests, the data did not show a statistically significant difference in the performance between the two groups. The authors suggest several reasons for why the difference was not significant: 1) the small scale of the study, 2) the lack of time for extensive SIOP training, and 3) the random assignment of teachers, who had varying degrees of interest in the study.

However, a follow-up study later extended this research to reveal a positive correlation between fidelity to the model and student achievement (Echevarria, Richards-Tutor, Chinn, & Ratleff, 2011). While all teachers in the SIOP group exhibited using features of the model, it was the degree to which they implemented the model that made all the difference. Through classroom observations of both SIOP and control group teachers, the researchers rated the teachers' degree of fidelity to implementing the SIOP Model. 'High-implementers,' or teachers who effectively implemented the model to a high degree, were found to have students who made the biggest gains on posttest assessments. In order to positively influence student achievement, best practices need to be implemented consistently and effectively, and teachers need support through ongoing professional development. Student achievement appears to be associated with how well instructional practices are implemented. Therefore, the authors emphasize that any future efforts to measure the effectiveness of research-based practices for ELLs focus on the degree of teacher fidelity to the practices, rather than just the presence or absence of them.

Johnson (2010) investigated how the Transformative Professional Development (TPD) model helped in-service science teachers improve the effectiveness of their instruction for Hispanic ELLs. Designed to help urban science teachers improve their teaching of Hispanic ELLs, the TPD model is grounded in research on culturally-responsive teaching, effective science teaching practices, and instructional congruence (Lee & Fradd, 1998). Johnson observed fifteen middle-school science teachers over three years. Each year of the study, the TPD intervention group teachers participated in a two-week summer session followed by monthly training days that focused on effective science instruction, culturally-relevant teaching strategies, and the integration of literacy skills into the science curriculum. Classroom observations revealed that TPD group teachers improved the quality of their instruction compared to teachers in the control group, who actually showed a decline in teacher quality. Student questionnaire results and posttest science scores from the TPD group showed increases in students' science attitudes and achievement compared to students in the control group. Johnson concludes by emphasizing the importance of supporting in-service teachers, rather than just pre-service teachers, in continually improving the effectiveness of their science instruction for ELLs. Johnson's study shows how sustained professional development for content-area teachers on ELL teaching strategies can, over a longer period of time, positively impact teachers' quality of instruction and student achievement.

In a very different study, Musetti and Tolbert (2010) explored the influence of a summer science enrichment program on ELLs' interest in science and motivation to pursue higher-level education. Fifty-five Latino high-school students, both current and former ELLs, participated in the Steps to College program on a college campus in Georgia. The intensive, month-long program was designed to provide students with an opportunity to experience a college environment, promote an interest in science and a "college-going mentality," and develop students' academic language. Grounded in theories of social capital and social constructivism, the Steps to College program attempted to provide a traditionally underserved group of students with less social capital the same access to resources that students with high social capital typically have, specifically access to challenging science content, information about attending college, and a support network of adults and peers.

While the data indicated that the Steps to College program helped students develop academic English, the most significant findings of the study revealed how the program impacted the students' motivation, aspirations, and identity (Musetti & Tolbert, 2010). First, students' motivation increased and many subsequently requested to be moved up to more challenging honors and AP courses in their school. Second, by the end of the program, 92% of the students indicated that they planned to pursue higher education, compared to 51% at the beginning of the program. Finally, the program helped the participants develop identities as future college students as well as realize that, despite societal deficiency views of Latinos, attending college was a real possibility.

Musetti and Tolbert conclude that such supplemental programs, while effective, are not sufficient and call on science teachers to provide more support for their ELLs "as they are the future scientists of our nation" (2010, p. 268). Callahan (2005) has also noted the dire lack of college preparedness among high-school ELLs. Of the 355 ELLs in her study, less than 2% had enough college-preparatory coursework to apply to a four-year university. Failure to promote higher-level education for high-school ELLs is a failure to invest in a whole generation of citizens since these students, as adults, will have a significant impact on the development of the nation.

Social Studies and History

Like mathematics and science texts, social studies and history texts contain subject-specific vocabulary and language that can be overwhelming to ELLs. History textbooks are idea-dense and filled with sophisticated linguistic features, such as nominalizations (*Westward Expansion, The Industrial Revolution)*, verbs that express causal relationships (*attributed to, led to, arose from)*, the passive voice *(was ratified)*, and polysemous vocabulary (*act, draft)* (Brown, 2007; Schleppegrell, Achugar, & Oteíza, 2004; Short, Vogt, & Echevarria, 2010; Zwiers, 2008). Even though authors relate historical events chronologically in a history text, like the action in a narrative, the prevalence of complex cause-and-effect relationships between events make history passages more challenging to comprehend and much less predictable (Brown, 2007; Zwiers, 2008). In addition, history texts often lack thorough explanations of topics and events, assuming that readers will be able to fill in the gaps with their own background knowledge (Beck, McKeown, & Gromoll, 1989; Brown, 2007). Finally, the content in social studies and history texts is culturally-specific. History texts may present topics and U.S.-centric viewpoints which ELLs may be unfamiliar with if they did not learn social studies in elementary school in the United States or if viewpoints in their home countries differ. And the historical knowledge and perspectives that ELLs do bring to the classroom may not be represented in their social studies texts or curriculum (Duff, 2001). Clearly, social studies and history texts can pose considerable challenges for ELLs if they lack the necessary academic language or their background knowledge and experiences differ from those presented in U.S. textbooks.

Using a systemic functional linguistics (SFL) approach, Schleppegrell and de Oliveira (2006) worked for several years on a project with secondary school history teachers in California to help them develop strategies for teaching the language of history to their ELLs. The researchers used a language-based approach with content-area teachers to promote the teachers' understanding of the linguistic demands of their discipline. The teachers learned how to closely analyze and deconstruct dense history texts in order to help their ELLs construct meaning from what they were reading. For example, the teachers learned how to divide complex sentences into specific parts in order to reveal key points about the participants, processes, and circumstances discussed in a text. A final evaluation revealed that the project had a statistically significant impact on students' achievement on a program-specific reading test (Gargani and Company, 2009). The authors advocate for a revised approach to content-based instruction that prioritizes language as a means to teach content rather than the reverse.

Brown (2007) emphasizes the importance of introducing ELLs to social studies content early on and provides four recommendations for how teachers can scaffold the complexities of social studies texts for students. First, content can be introduced through graphic organizers that highlight connections between key ideas and events. Second, teachers can provide an outline that previews the text, thus creating a 'road map' that

ELLs can follow. Third, teachers can guide students with specific questions to focus them on the most important information. Finally, students can read about the same topics in materials developed for lower grade levels, which helps them access similar content in their grade-level textbooks.

Several articles explore how social studies teachers with little to no ELL training implemented effective practices to accommodate the needs of ELLs in their classrooms (Haneda, 2009; Szpara & Ahmad, 2007; Wang, Many, & Krumenaker, 2008). Szpara & Ahmad (2007) discuss best practices for ELLs in the social studies classroom, presenting specific examples of successful instruction from their work with five mainstream high-school social studies teachers. The authors focus on how the teachers create a supportive learning environment, teach academic skills through CALLA, and reduce the cognitive complexity of content materials. Techniques the teachers employed, such as collaborating with ESL colleagues, using cooperative grouping, explicitly teaching vocabulary, allowing students to use their L1s, and providing bilingual materials are also discussed as effective instructional practices in other social studies articles reviewed in this report (Haneda, 2009; Vaughn, et al, 2009; Wang, Many, & Krumenaker, 2008). This overlapping research highlights proven methods that teachers can employ to make social studies content more comprehensible for their ELLs.

Through a case study of a middle-school sheltered social studies teacher, Haneda (2009) investigates the discursive and socialization strategies the teacher used with her

ELLs to help them build content knowledge and develop identities as competent members of their school and community. Haneda discovered that the teacher's success with her ELLs stemmed from her vision of what counted as learning in her classroom. The teacher's belief that learning involved both content and identity development directly affected the discursive and instructional practices she used with her ELLs. Even though most whole-class interactions followed a teacher-led triadic dialogue pattern, the teacher regularly used uptake and reformulation strategies that validated her students' contributions, helped them build social studies knowledge, and often led to spontaneous discussions. In addition to ensuring her ELLs learned content, the teacher prioritized their socialization and fostered their development of identities as independent and responsible learners. As a result, the ELLs perceived their social studies class to be highly interactive and felt more comfortable and confident there than in their other mainstream classes. Based on the results of the study, Haneda argues for a broader definition of what counts as learning in order to provide ELLs with equitable learning opportunities.

Wang, Many, and Krumenaker (2008) also conduct a case study of a social studies teacher and the instructional practices he used with his ninth-grade mainstreamed ELLs. The underlying focus of the research was how the practice of mainstreaming ELLs affects content teachers. Classroom observations and interviews revealed that the presence of ELLs in the teacher's mainstream social studies classroom directly influenced the instructional approaches he used.

Despite his lack of ESL training, the teacher was keenly aware of the academic and linguistic challenges his ELLs faced and, as a result, effectively differentiated instruction and implemented multiple ESL teaching strategies. He provided content in multiple formats, used alternative assessments, modified coursework, grouped learners with the same L1, and allowed students to use their home languages. However, the researchers question whether the use of some strategies, such as covering content more broadly and less deeply and using below-grade-level materials, may have compromised ELLs' access to quality, grade-level content. Teachers must be careful that the scaffolds they provide for ELLs enhance their access to grade-level content rather than water the content down. Furthermore, while the strategies the teacher employed ensured the inclusion of his ELLs, they actually slowed learning down and made the content less challenging for the native English speakers in the class. Thus the teacher's instructional modifications for his ELLs could, to some degree, have negatively impacted the learning for both ELLs and native English speakers in his class.

The researchers conclude that specific ESL strategy training may not be sufficient to prepare content teachers to effectively teach ELLs in mainstream classrooms. Instead, they propose professional development solutions that augment ESL training, such as team teaching between ESL and content teachers and using bilingual materials.

In contrast to the case-study above, two intervention studies by Vaughn, et al, (2009) reveal how the implementation of proven instructional practices for ELLs positively influenced all students’ vocabulary and comprehension scores in mainstream middle-school social studies classes. For nine to twelve weeks, students in two treatment groups received daily instruction comprised of explicit vocabulary instruction, the use of video to build background, the use of graphic organizers for writing, and peer pairing. During the study, students in both treatment and control groups studied the same material with the same textbook. Pre- and post-test results revealed that both ELLs and non-ELLs benefited from the intervention, outperforming students in the control groups, who received their usual instruction. In addition, ELLs in the treatment group performed better than non-ELLs in the control group in the post-test. The researchers conclude that mainstream teachers might feel more confident in using instructional approaches for ELLs if the practices also benefit non-ELLs in their classrooms.

Two small survey studies report on mainstream social studies teachers’ challenges, perceptions, and needs with regard to teaching ELLs (Cho & Reich, 2008; O’Brien, 2011). Cho and Reich (2008) surveyed thirty-three mainstream high-school social studies teachers about the same issues as a previous study did with science teachers (Cho & McDonnough, 2009). The researchers used the same survey to ask the social studies teachers about ELL accommodations, challenges, and professional development. Like the science teachers, the social studies teachers also felt most challenged by language barriers and ELLs’ lack of background knowledge, followed by a lack of time and resources. However, in contrast to the science teachers, the social studies teachers ranked students’ lack of background knowledge as their biggest challenge. The authors suggest that this difference may reflect the fact that social studies knowledge is often culturally-specific and develops slowly over time.

As previously discussed, the survey from both studies includes a question about teaching challenges that promotes a deficit-perspective of ELLs by emphasizing what they lack. A different survey study by O’Brien (2011) also asked mainstream high-school social studies teachers about the challenges they faced when teaching ELLs. However, O’Brien used Reeves’s (2006) survey instrument, which asked about teaching challenges through an open-ended question. O’Brien found that after language differences, the second most common challenge teachers indicated was their inability to modify coursework for ELLs in their classrooms. It’s worth noting that when the teachers responded to an open-ended question, a large number indicated that their teaching difficulties stemmed from what they lacked, specifically lesson modification strategies, rather than what their ELLs lacked. In addition, other studies in the literature (Haneda, 2009; Salinas, Fránquiz, & Reidel, 2008) reveal how teachers’ specific instructional practices capitalize on what ELLs’ know as opposed to what they don’t. These studies focus on teachers who, instead of viewing ELLs from a deficit perspective, create learning opportunities for their ELLs by building on what their students bring to the classroom, that is, their cultural background knowledge and experiences.

With regard to accommodations, the social studies teachers in Cho & Reich’s study (2008) indicated that they primarily accommodated ELLs by allowing extra time for tasks and adjusting their rate of speech. As noted in the science teacher study (Cho & McDonnough, 2009), these types of accommodations require less effort by the teacher than modifying assignments or instructional practices. Results from O'Brien's study (2011) also corroborate some of the findings by Cho & Reich. While 83% of the teachers in O'Brien's study indicated they'd received prior ELL training, they frequently responded that they found it difficult to adapt coursework for their students. Cho and Reich (2008) discovered that more than three-quarters of the social studies teachers they surveyed never / rarely provided their ELLs with different tasks and assignments. Together, these findings may support the conclusion that content teachers do not know how to modify lessons for ELLs or, despite having previous ELL training, still struggle with doing so.

Two of the studies discussed above (Cho & Reich, 2008; Cho & McDonnough, 2009) in addition to a study by Pawan and Ortloff (2011) contribute to the research on content-area and ESL teacher collaboration. Cho and McDonnough (2009) and Cho and Reich (2008) found that 51.6% of the science teachers and 31.3% of the social studies teachers they surveyed never / rarely consult with ELL teachers. Through interviews with 57 content-area teachers, ESL teachers, and administrators, Pawan and Ortloff (2011) revealed the factors that facilitate or hinder teacher collaboration. Since the small sample sizes limit the generalizability of these studies, further research should investigate issues related to content-area and ESL teacher collaboration on a larger scale.

Recommendations for Pedagogy, Practice, and Professional Development

From recent research across the three content areas, several common conclusions can be drawn. First, the language of math, science, and social studies contains specialized vocabulary and linguistic features that ELLs need to acquire. Reading, writing, listening, and speaking in the content areas, involves the use of sophisticated academic English that differs from the everyday social language with which ELLs are more familiar. Academic English poses challenges for ELLs because it is cognitively-demanding and often context-reduced (Cummins, 1981). Content-area teachers cannot assume that students are able to understand and readily use abstract academic language. Teachers must become aware of the complex language that characterizes their disciplines and explicitly teach it to ELLs. Academic language instruction involves more than just teaching individual vocabulary words; equal emphasis must be given to the grammatical structures that surround and connect these terms to create meaning. Failure to do so limits ELLs' ability to fully develop academic discourse. Teaching ELLs how to deconstruct text, recognize Latin prefixes and suffixes, and identify cognates are ways to help students unpack the complex language of content-area texts. Finally, teachers need to move away from teacher-centered classroom talk and promote discussions that provide ELLs ample opportunities to use newly-acquired academic language in meaningful and communicative ways.

Second, both ELLs and content-area teachers benefit greatly from capitalizing on students' first languages. While most of the studies on L1 use in this report occurred in math classrooms, research in science and social studies contexts also addressed this topic. Reeves (2006) discovered that mainstream content-area teachers did not believe ELLs benefited from using their first languages in school; however, current research suggests otherwise. Students' first languages can help them acquire academic content in multiple ways. ELLs may use their L1 as a resource to communicate their understanding of math, science, or social studies concepts, especially if they lack the proficiency in English to do so. Bilingual materials can help ELLs explore topics more deeply, allowing them to fully access grade-appropriate content as well as stay on track with their native English-speaking classmates. Using bilingual materials also allows ELLs to transfer linguistic and content knowledge from their first languages to English. Finally, when students with the same first languages are grouped to work together, beginning ELLs can learn from their more English-proficient peers.

Finally, content-area teachers have critical challenges and needs with regard to teaching ELLs. Middle and secondary ELLs are linguistically and culturally diverse and enter school with different levels of language proficiency, content-area knowledge, and prior education. Fewer resources exist for ELLs in secondary schools, and mainstream teachers are often unprepared to work with these students in their classrooms. As a result, teachers struggle with making instructional modifications for ELLs and providing them with alternative assignments and coursework. Mainstream teachers may also be concerned that using instructional approaches for ELLs could negatively impact learning for non-ELLs in their classrooms. In addition, teachers have concerns about the lack of ESL training and support provided by their schools and districts. Yet, the number of ELLs in middle and high schools will continue to grow, and content-area teachers will be charged with helping these students succeed.

Teachers need support in implementing effective, research-based instructional approaches for ELLs, such as the SIOP Model. More specifically, teachers need to learn and apply strategies that are critical to ELLs' success in the classroom, such as integrating language and content, linking topics to students' backgrounds and experiences, providing comprehensible input, grouping students strategically, and creating opportunities for meaningful classroom interaction. Teacher training should also include guidance in modifying instruction without watering down content to ensure that ELLs have equitable access to the curriculum. In order to make new instructional approaches automatic, teachers may need time and coaching. Therefore, professional development for in-service teachers should be collaborative and ongoing rather than isolated, one-shot sessions.

Given the diversity of ELLs in secondary classrooms, teachers need to know about their students' cultural, linguistic, and educational backgrounds. Such knowledge can help teachers in several ways. First, teachers are better able anticipate ELLs' linguistic and academic challenges and needs. In addition, they can use ELLs' background knowledge and experiences to contextualize learning and help their students make connections to new content. Finally, teachers can encourage rich, multicultural exchanges between ELLs and non-ELLs by encouraging ELLs to share the unique perspectives they bring to the classroom.

Teachers can also benefit from an understanding of how learners acquire a second language. ESL teachers and support staff can help mainstream teachers fill this knowledge gap. Teachers need regular access to ESL or bilingual staff. Collaboration between content-area and ESL teachers allows colleagues to share their linguistic and content expertise and work together to meet the needs of ELLs.

While the studies reviewed in this report cover a variety of topics with regard to secondary ELLs and content instruction, gaps in the research remain. Future studies are needed to investigate the effectiveness of ESL instructional approaches, such as the SIOP model, over extended periods of time. Longer studies would allow content-area teachers more time to become comfortable with best practices for ELLs and make these practices routine. Future intervention research on ELLs could also look at the effects that ESL teaching approaches have on non-ELLs in the same classrooms. Additional research could also explore how ELLs use their L1s to facilitate learning in content-area classes, possibly dispelling misconceptions about L1 use and revealing how the L1 can be a resource for learning. Finally, more studies are needed to gain knowledge about mainstream teachers' beliefs, attitudes, and concerns about teaching ELLs in their classroom. In addition to surveys, interviews might shed additional light on the challenges mainstream teachers face and what more can be done to help them.

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